

REMARKS

Following a prior restriction requirement, Claims 8-12 and 17-24 have been withdrawn as being drawn to a non-elected species. However, independent Claims 1, 7 and 13 and dependent Claims 2-6 and 14-16 have been examined as described below. Of these, independent Claim 7 is generic. Indeed, the prior restriction requirement dated July 30, 2007, similarly noted that independent Claim 7 was generic. The specification is amended to correct a typographical error. No new matter has been added by way of this amendment.

The Official Action rejects independent Claim 7 under 35 U.S.C. § 112, second paragraph, as being indefinite. Claim 7 has been amended to recite that the first IDFT unit includes m IDFT units, and the second IDFT unit includes n IDFT units. Support for this amendment can be found, for example, at paragraphs [0071]-[0072]. Applicant respectfully submits that by virtue of the amendment, claim 7 is no longer indefinite. In this regard, it is noted that even following its amendment, independent Claim 7 remains generic. Accordingly, the rejection of claim 7 under 35 U.S.C. § 112, second paragraph, is overcome.

The Official Action rejects Claims 1, 2 and 7 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,471,464 to Ikeda (hereinafter the "Ikeda '464 patent"). The Official Action also rejects claims 13-16 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Application Publication No. 2005/0276254 to Zhang (hereinafter the "Zhang '254 publication"). Finally, the Official Action rejects Claims 3-6 under 35 U.S.C. § 103(a) as being unpatentable over the Ikeda '464 patent and the Zhang '254 publication. Based on the following remarks, reconsideration of the present application and allowance of the current set of claims is respectfully requested.

Applicant initially notes that Claims 1-4 and 13-16 have been amended to clarify the claimed invention and further distinguish it over the cited references. No new matter has been added by way of these amendments. Generally, the present application discloses an orthogonal frequency division multiplexing (OFDM) wireless communication system operable on a frequency selectable channel and a channel compensation method for reducing bit error rates (BER) in an interval with a narrow channel amplitude and for improving total rates. In terms of

amended independent Claim 1, for example, the OFDM wireless communication system comprises a transmitter for performing inverse discrete Fourier transform (IDFT) on information transmit vectors at least twice to modulate it into OFDM signals, transmitting the modulated OFDM signals through a multipath fading channel, modulating a pilot symbol vector for predicting an amplitude and a phase of the multipath fading channel into an OFDM signal, and transmitting the modulated OFDM signal through the multipath fading channel. In this regard, the transmitter comprises a first IDFT unit for performing IDFT on the information transmit vectors and output IDFT-performed signals; and a second IDFT unit for performing IDFT on the IDFT-performed signals output from the first IDFT unit to modulate them into OFDM signals.

The system further comprises a receiver for demodulating the pilot symbol vector received through the multipath fading channel to predict the amplitude and the phase of the multipath fading channel, using the predicted amplitude and phase to compensate the amplitude and the phase multiplied to the received information transmit vectors, performing DFT on the compensated information transmit vectors to average a noise signal value increased by the channel compensation in a specific interval with an amplitude of the channel with less than a mean value into a mean value within an OFDM symbol interval, and outputting the mean value. In this regard, the receiver comprises a first DFT unit for demodulating the received information transmit vectors into OFDM signals; and a second DFT unit for performing DFT on the compensated information transmit vectors and averaging a noise signal value which becomes enhanced in a specific interval with an amplitude of the channel with less than a mean value, to a mean value within a symbol interval.

The Ikeda '464 patent discloses an OFDM demodulation apparatus and method which generate a discrete Fourier transform (DFT) timing window signal and enable demodulation of the OFDM modulated signal even when the signal is affected by noise. Ikeda also discloses an OFDM modulation apparatus including a first IDFT means for performing IDFT on a first digital component signal and a second IDFT means for performing IDFT on a second digital component signal. The first component signal is an in-phase signal component (I channel signal) while the second is a quadrature signal component (Q channel signal). In this regard, Ikeda discloses a first IDFT means for performing IDFT on an I channel signal and a second IDFT means for

performing IDFT on a Q channel signal. Accordingly, IDFT is performed only once on each component signal. At most, IDFT circuit 303 performs IDFT processing only once on the orthogonal relationship between the I channel signal and the Q channel signal. See column 16, lines 50-53 and Claim 1 of the Ikeda '464 patent.

By contrast, independent Claim 1 recites a transmitter for performing IDFT (inverse discrete Fourier transform) on information transmit vectors at least twice to modulate them into OFDM (orthogonal frequency division multiplexing) signals. In this regard, the first N-point IDFT unit 131 performs IDFT on the information transmit vectors and the second N-point IDFT unit 132 performs IDFT on the IDFT-performed signals output from the first IDFT unit to modulate them into OFDM signals. See, for example, Figure 1 and paragraph [0039]. This process is applied in order to reduce error rates in an interval with a channel amplitude below an average, as described above.

Because the Ikeda '464 patent fails to at least teach or suggest performing IDFT on information transmit vectors at least twice to modulate them into OFDM signals, as recited in amended independent Claim 1, the Ikeda '464 patent fails to teach or suggest each and every element of independent Claim 1. Because Claims 2-6 depend from and include the elements of amended independent Claim 1, the Ikeda '464 patent also fail to teach or suggest each and every element of dependent Claims 2-6 for at least the same reasons as described above in conjunction with amended independent Claim 1.

With respect to the rejection of dependent Claim 2 as being anticipated by the Ikeda '464 patent, it is initially noted that amended Claim 2 include the recitations of amended independent Claim 1 and is not taught or suggested by the Ikeda '464 patent for the reasons set forth above. Moreover, the Ikeda '464 patent fails to teach or suggest a third IDFT unit for modulating a pilot symbol vector as recited in Claim 2. Applicant fails to appreciate how the passage referred to on page 6 of the Office Action teaches or suggests such feature. Accordingly, the Ikeda '464 patent also fails to teach or suggest each and every element of dependent Claim 2 for this additional reason.

Amended independent Claim 7 recites similar elements as independent Claim 1. In this regard, independent Claim 7 recites a first IDFT (inverse discrete Fourier transform) unit

including m IDFT units for performing IDFT on the converted information transmit vectors; an interleaver for writing subchannel values of the respective transmit vectors received from the IDFT unit in an $m \times n$ memory buffer in the first direction; a second IDFT unit including n IDFT units for reading the subchannel values written in the first direction in the second direction when the writing in the first direction is finished, performing IDFT on the read subchannel values, and modulating them to OFDM (orthogonal frequency division multiplexing) signals. Again, IDFT is performed at least twice on the converted information transmit vectors: at least once by at least one first IDFT unit and at least once by at least one second IDFT unit. As discussed above with respect to independent Claim 1, the Ikeda '464 patent fails to at least teach or suggest performing IDFT on information transmit vectors at least twice to modulate it into an OFDM signal. Similarly, the Ikeda '464 patent fails to at least teach or suggest performing IDFT on the information transmit vectors at least twice to modulate them into OFDM signals as recited in independent Claim 7. Therefore, the Ikeda '464 patent fails to teach or suggest each and every element of independent Claim 7 for at least this reason.

Moreover, S/P converter 861, referred to by the Office Action as disclosing Applicant's serial to parallel converter for converting the mapped symbol into vector data, is used in conjunction with a demodulation apparatus 85. Applicant's serial to parallel converter recited in Claim 7 is used in conjunction with a transmitter or modulation apparatus. Furthermore, the Ikeda '464 patent does not appear to disclose an interleaver for writing subchannel values of the respective transmit vectors received from the IDFT unit in an $m \times n$ memory buffer in a first direction, as also recited in Claim 7. For the sake of the argument but not as an admission, even if the Ikeda '464 patent did disclose an interleaver, the Ikeda '464 patent would still fail to teach or suggest an $m \times n$ memory buffer as recited in Claim 7. Indeed, the size of the memory buffer of Claim 7 is based on the number of first IDFT (m) and second IDFT (n) units. The Ikeda '464 patent discloses two buffer memories 306 and 307, but does not appear to teach or suggest any relationship between the size of the memory buffer and the number of first and second N-point IDFT units. Moreover, the Ikeda '464 patent fails to teach or suggest first and second IDFT units, as described above. Accordingly, the Ikeda '464 patent fails to teach or suggest each and every element of independent Claim 7 for these additional reasons.

Turning now to the rejection of Claims 13-16, the Zhang '254 publication discloses methods and apparatus for use in reducing residual phase error (RPE) in OFDM communication signals. The Zhang '254 publication discloses a pilot symbol-aided channel estimation scheme in a wireless OFDM system that uses a block of detected symbols to estimate and remove the RPE after channel compensation. In this regard, in a serial-to-parallel conversion process, one pilot symbol is inserted in the information data sequence for a user i before its data is multiplexed with other users' data. Next, a data sequence of length N from K users is converted into N parallel symbols and then fed into an Inverse Fast Fourier Transform (IFFT). Accordingly, the Zhang '254 publication discloses that IFFT is performed on a data sequence with a pilot symbol inserted therein. In other words, IFFT is performed on the combination of the data sequence with the pilot symbol in the same IFFT unit.

By contrast, amended independent Claim 13 recites a) performing IDFT (inverse discrete Fourier transform) on information transmission vectors to modulate the vectors into OFDM (orthogonal frequency division multiplexing) signals, and transmitting the modulated signals through the multipath fading channel; and (b) modulating a pilot symbol vector for predicting an amplitude and a phase of the multipath fading channel into an OFDM signal, and transmitting the modulated signal through the multipath fading channel. In this regard, the information transmission vectors and the pilot symbol vector are separately modulated in separate IDFT units. See Figure 1 and accompanying disclosure of the present application.

Because the Zhang '254 publication discloses performing IFFT on the combination of a data sequence and a pilot symbol in the same IFFT unit, the Zhang '254 publication fails to teach or suggest that the data sequence and the pilot symbol are separately modulated in separate IFFT units as provided in independent Claim 13. Accordingly, the Zhang '254 publication fails to at least teach or suggest each and every element of independent Claim 13. Because Claims 14-16 depend from and include the elements of independent Claim 13, the Zhang '254 publication also fails to teach or suggest each and every element of dependent Claims 14-16 for at least the same reasons as described above in conjunction with independent Claim 13.

With respect to the rejection of dependent Claims 3-6 as being unpatentable over the Ikeda '464 patent in view of the Zhang '254 publication, it is initially noted that Claims 3-6

include the recitations of independent Claim 1 and are accordingly not taught or suggested by the Ikeda '464 patent for the reasons set forth above. The Zhang '254 publication fails to cure the deficiencies of the Ikeda '464 patent with respect to independent Claim 1 and is not cited for such. Indeed, the Zhang '254 publication also fails to teach or suggest performing IDFT on information transmit vectors at least twice to modulate them into OFDM signals, as recited in independent Claim 1 but lacking from the Ikeda '464 patent. Because Claims 3-6 depend from and include the elements of independent Claim 1, the Zhang '254 publication also fails to teach or suggest each and every element of dependent Claims 3-6 for at least the same reasons as described above in conjunction with independent Claim 1. Therefore, Claims 3-6 are not taught or suggested by the Ikeda '464 patent and the Zhang '254 publication, either individually or in combination.

Accordingly, Applicant respectfully submits that the rejections of Claims 1-7 and 13-16 are therefore overcome.

Consideration Of Previously Submitted Information Disclosure Statement

It is noted that an initialed copy of each of the PTO Form 1449 that were submitted with each of Applicant's Information Disclosure Statement filed August 29, 2005 and February 14, 2007 have not been returned to Applicant's representative with the Office Action. Additionally and in contrast to the indication of the Office Action that an Information Disclosure Statement filed November 24, 2003 has been considered, Applicant notes that no Information Disclosure Statement was filed on November 24, 2003. Accordingly, it is requested that an initialed copy of each of the Form 1449 be forwarded to the undersigned with the next communication from the PTO. In order to facilitate review of the references by the Examiner, a copy of the Information Disclosure Statements and the Forms 1449 are attached hereto. Any copies of the cited references that were necessary for consideration of the Information Disclosure Statement were provided at the time of filing the original Information Disclosure Statement, and, therefore, no additional copies of the references are submitted herewith. Applicant will be pleased to provide additional copies of the references upon the Examiner's request if it proves difficult to locate the original references.

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CONCLUSION

In view of the claim amendments and the foregoing remarks, Applicant respectfully submits that all of the claims of the present application are in condition for allowance. It is respectfully requested that a Notice of Allowance be issued in due course. The Examiner is encouraged to contact Applicant's undersigned attorney to resolve any remaining issues in order to expedite examination of the present application.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



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